

NORTH CASCADES ECOREGION



PHYSIOGRAPHY AND BIODIVERSITY

Geography

The North Cascades ecoregion includes the Cascade Mountains north of Snoqualmie Pass and west of the crest and extends northward into British Columbia. Approximately 10 percent of Washington occurs within this ecoregion. As of 2003, less than two percent of the Washington portion of the ecoregion had been converted to urban and agricultural development. Major rivers in the ecoregion include the Skagit, Stillaguamish, Snohomish and Nooksack. The Skagit is the largest river flowing into Puget Sound. Approximately 240 natural mountain lakes are contained within the rugged landscape of the North Cascades ecoregion.

Geology

The North Cascades is composed of highly dissected, glaciated mountain terrain, mostly between 1000 and 7000 feet above sea level. The highest peaks are volcanoes that rise to more than 10,000 feet. Valley bottoms extend down to as low as 500 feet. Glacially carved U-shaped valleys and cirques are prominent features. Watersheds typically begin as steep-gradient small stream drainages that feed major rivers flowing into the adjacent Puget Trough ecoregion. Natural lakes, most of which were created by glacial processes, are plentiful.

Climate

High precipitation typifies the ecoregion varying from approximately 60 to 160 inches per year. Most precipitation accumulates from October through April as snow and rain. High elevations in the mountains are covered with snow for many months. Middle elevations have significant snowpacks that fluctuate over the course of the winter with rain-on-snow events. Lower elevations within the ecoregion accumulate little snow or have transient snowpacks.

Habitat and Plant Associations

The vegetation of the North Cascades ecoregion in Washington consists mostly of western hemlock/Douglas-fir/western redcedar forests at low elevations, Pacific silver fir/western hemlock forests at middle elevations, and a mosaic of mountain hemlock/silver fir forests and subalpine parkland at high elevations. Natural stand replacement fires occur at irregular intervals of 90 to 250 years. Above timberline, alpine heaths, meadows and fellfields (stony habitats with low mat and cushion plants) are interspersed with barren rock, ice and snow. Special habitats include riparian areas dominated by broadleaf trees, avalanche chutes dominated by Sitka alder or vine maple and wetlands. Rare plant species in this ecoregion are often circumboreal species (species occurring in high northern latitudes around the world) on the southern edge of their range, with populations scattered in the high Cascades.

Biodiversity

The North Cascades ecoregion has experienced less logging disturbance and development than other regions of the Cascade Mountains and retains high biodiversity, especially in the North Cascades National Park and designated wilderness areas. The region is home to approximately 75 mammal species in 20 families; 21 species of reptiles and amphibians representing at least four orders; roughly 200 species of birds in 38 families; and at least 28 species of fish. Recent surveys have documented over 500 types of land insects and approximately 250 aquatic invertebrate species. This ecoregion is one of the few in Washington that provides important habitat for wide-ranging carnivores including lynx, gray wolves, grizzly bears and wolverines. Salmon inhabit most of the large rivers. The ecoregion hosts a wide variety of breeding birds, including bald eagles, osprey and harlequin ducks, as well as a variety of neotropical migrants.



LAND OWNERSHIP

Major landowners in the North Cascades ecoregion are the National Park Service, the USDA Forest Service (Mt. Baker-Snoqualmie National Forest), Washington Department of Natural Resources, and private timber companies. The private land in the Cascades is a legacy of the 1864 Northern Pacific Land Grant, which bestowed vast amounts of land on the railroad that built a trans-continental link to the Pacific Northwest. The Weyerhaeuser Co. moved into the region, just over a century ago, through a 900,000-acre land sale by railroad baron James J. Hill to his Minnesota neighbor, timber magnate Frederick Weyerhaeuser. The Plum Creek Timber Co. is an independent company, but has its origins as the Burlington Northern subsidiary that managed the company's timber holdings from western Montana to the Washington Cascades.

The North Cascades National Park Service Complex is made up of three park units managed as one: North Cascades National Park and Ross Lake and Lake Chelan National Recreational Areas. Each area contains different ecosystems and wilderness attributes. A vast majority of the park complex, over 93 percent, is managed as the Stephen T. Mather Wilderness, established by Congress in 1988. North Cascades National Park is notable for its large size and strict protection status.

Mt. Baker-Snoqualmie National Forest encompasses a large portion of the remaining westside slopes of the North Cascades ecoregion (1,724,229 acres), about 41% of which is designated wilderness.

Settlement within the remote and rugged North Cascades occurred slowly over many years. Although some towns developed along the North Cascades Highway, a combination of natural and cultural factors prevented the growth of communities of any size in the ecoregion. The difficulties of physical access and the relatively small amount of workable agricultural land were primary deterrents to settlement. In addition, the lack of surveyed lands and the creation of the Washington Forest Reserve in 1887 may also have discouraged individuals from seeking homesteads in the area that is today mostly a national park. Dominant land uses in the North Cascades ecoregion include recreation, forestry and conservation.

ECOREGIONAL CONSERVATION PARTNERSHIPS

Effective conservation of fish, wildlife and biodiversity in Washington requires close coordination and cooperation with many public and private conservation partners. Major partners in the North Cascades ecoregion include:

- National Park Service
- U.S. Bureau of Land Management
- U.S. Fish & Wildlife Service
- USDA Forest Service (Mt. Baker-Snoqualmie National Forest)
- Washington Department of Natural Resources
- Washington State Parks and Recreation Commission
- Whatcom, Skagit, Snohomish, King and Kittitas Counties

The Washington Department of Fish and Wildlife also works closely on conservation projects with private conservation partners such as The Nature Conservancy, Audubon Washington, the Grizzly Bear Outreach Project, Ducks Unlimited and a growing number of local land trusts.

Major Plans

A number of major planning efforts involving WDFW and its public and private partners are ongoing or completed that influence and guide the conservation and management of fish and wildlife resources in the North Cascades. Included among these major efforts are:

- North Cascades Ecoregional Assessment
- North Cascades National Park General Management Plan
- WDFW Wildlife Area Management Plan
- Mt. Baker-Snoqualmie General Management Plan
- Northwest Forest Plan
- Lynx Recovery Plan (2001)
- USFWS Grizzly Bear Recovery Plan (1993)
- Northern Rocky Mountain Wolf Recovery Plan (1991)
- Fisher Recovery Plan (2004)
- Marbled Murrelet Recovery Plan (1997)
- Northern Spotted Owl Recovery Plan (1992)
- Oregon Spotted Frog Recovery Plan (1998)
- North Cascade (Nooksack) Elk Herd Management Plan (2002)
- National Wildlife Refuge Comprehensive Conservation Plans (in progress)
- Outline for Salmon Recovery Plans (2003)
- Bull Trout and Dolly Varden Management Plan (2000)

Supporting references to these and other important planning documents are included at the end of this chapter and/or in Appendix **.

SPECIES AND HABITATS OF GREATEST CONSERVATION NEED

*This section provides a short summary of priority species and habitats for the Washington portion of the North Cascades ecoregion. Supporting tables and information for these species and habitats can be found in Appendix **.*

Species of Greatest Conservation Need (SGCN)

The following species list for the North Cascades ecoregion includes those statewide Species of Greatest Conservation Need (see Appendix **) found in the ecoregion for all or part of their lifecycle. Supporting tables and information for these species and habitats can be found in Appendix **).

COMMON NAME	SCIENTIFIC NAME	State Status
Mammals		
Pacific Townsend's big-eared bat	Corynorhinus townsendii townsendii	C
Gray wolf	Canis lupus	E
Grizzly bear	Ursus arctos	E
Fisher	Martes pennanti pacifica	E
Wolverine	Gulo gulo	C
Lynx	Lynx canadensis	T
Elk (Nooksack herd, mixed)	C.e. nelsoni, roosevelti	

COMMON NAME	SCIENTIFIC NAME	State Status
Mountain goat	Oreamnos americanus	
Birds		
Common loon	Gavia immer	S
Western grebe	Aechmophorus occidentalis	C
Great blue heron	Ardea herodias	M
Harlequin duck	Histrionicus histrionicus	
Northern goshawk	Accipiter gentilis	C
Golden eagle	Aquila chrysaetos	C
Marbled murrelet	Brachyramphus marmoratus	T
Flammulated owl	Otus flammeolus	C
Northern spotted owl	Strix occidentalis caurina	E
Vaux's swift	Chaetura vauxi	C
Pileated woodpecker	Dryocopus pileatus	C
Western bluebird	Sialia mexicana	M
Amphibians		
Larch Mountain salamander	Plethodon larselli	S
Western toad	Bufo boreas	C
Oregon spotted frog	Rana pretiosa	E
Columbia spotted frog	Rana luteiventris	C
Fish		
River lamprey	Lampetra ayresi	C
Pacific lamprey	Lampetra tridentata	
Inland redband trout	Oncorhynchus mykiss gairdneri	
Salish sucker	Catostomus sp. 4	M
Invertebrates		
Beller's ground beetle	Agonum belleri	C
Long-horned leaf beetle	Donacia idola	C
Propertius' duskywing butterfly	Erynnis propertius	M
Johnson's hairstreak butterfly	Mitoura johnsoni	C

In ranking species for the Species of Greatest Conservation Need (SGCN) list, all ecoregional assessment target species were considered, but not all ranked high enough to be on the SGCN list. A complete list of North Cascades Ecoregional Assessment target species can be referenced in the North Cascades Ecoregional Assessment link on the CWCS website.

Species Conservation in the North Cascades Ecoregion

Species of Greatest Conservation Need (SGCN) found in the North Cascades ecoregion (see table above) include those classified by WDFW as Endangered, Threatened, Candidate or Monitor species, as well as species identified by WDFW as needing additional research or funding attention. A range of conservation actions are recommended for these SGCN species at both the statewide and ecoregional levels. These recommended conservation actions are summarized in a series of matrices included as an appendix of the CWCS. The matrices also display the life history, population status and distribution of these species.

Ecoregion Habitat Overview

Vegetation in the North Cascades ecoregion exhibits relatively high diversity in response to variations in elevation and other conditions. Lower elevation areas tend to be dominated by mature stands of western redcedar and western hemlock, along with lesser populations of lodgepole pine, Engelmann spruce and alpine fir. Higher elevation species typically comprise mountain hemlock, Pacific silver fir and yellow cedar. Douglas-fir can be found in drier sites, while red alder favors disturbed alluvial sites. About 75 percent of the ecoregion is covered by western lowland and montane coniferous forest habitat.

The following habitat types, which are classified, coded and described in Wildlife and Habitat Relationships in Oregon and Washington (WHROW), are present in the North Cascades ecoregion. In the next section, descriptions are provided for some of the critical habitats for the Species of Greatest Conservation Need.

- Westside Lowlands Conifer-Hardwood Forest
- Montane Mixed Conifer Forest
- Eastside (Interior) Mixed Conifer Forest
- Lodgepole Pine Forest and Woodlands
- Upland Aspen Forest
- Subalpine Parkland
- Alpine Grasslands and Shrublands
- Eastside (Interior) Grasslands
- Agriculture, Pasture and Mixed Environs
- Urban and Mixed Environs
- Open Water: Lakes, Rivers and Streams
- Herbaceous Wetlands
- Westside Riparian-Wetlands
- Montane Coniferous Wetlands

(A MAP OF WHROW HABITATS IN THE ECOREGION WILL BE INSERTED HERE)

Priority Habitats in the North Cascades Ecoregion

The following three habitat types have been identified as the highest priority for conservation action in the North Cascades ecoregion. Selection of these habitats was determined by their importance to regional Species of Greatest Conservation Need, as well as other factors.

- Westside Lowlands Conifer-Hardwood Forest
- Subalpine Parkland
- Westside Riparian-Wetlands

Westside Lowlands Conifer-Hardwood Forest

This habitat occurs as lowland to low montane forests on the western slopes of the North Cascades. Western hemlock is the most characteristic species; vegetation is also dominated by western redcedar, Douglas-fir, Sitka spruce and red alder. Understory shrub species include salal, dwarf Oregon grape, vine maple, Pacific rhododendron, salmonberry, trailing blackberry, red elderberry, foos huckleberry, oval-leaf huckleberry, evergreen huckleberry and red huckleberry. Sword fern is the most common herbaceous species and is often dominant on nitrogen-rich or moist sites. Other forbs and ferns that frequently dominate the understory are oxalis, deer fern, bracken fern, vanilla leaf, twinflower, false lily-of-the-valley, Siberian spring beauty, foam flower, inside-out flower and beargrass.

Large areas of this forested habitat remain on the west slopes of the North Cascades ecoregion, although only a fraction of the original old growth remains, mostly in the North Cascades National Park. This habitat forms the matrix within which other habitats occur as patches, especially westside riparian-wetlands and, less commonly, herbaceous wetlands and open water. Bordering this habitat at upper elevations is montane mixed conifer forest.

Selected Species Closely Associated with Westside Lowlands Conifer-Hardwood Forest in the North Cascades Ecoregion

Fisher	Marbled murrelet
Northern spotted owl	Western bluebird
Johnson's hairstreak butterfly	Nooksack elk herd

Conservation Problems:

Impacts to valley bottoms: A number of human activities pose significant potential threats to the integrity of this forest habitat, particularly in valley bottoms. These activities include timber harvest, development, transportation, urbanization, low-density development, mining and hydropower production.

Old growth and forest biodiversity: Maintenance of old growth forest and diversity is a major, controversial issue. Much of the recent focus on old growth timber protection has been spotted owl and marbled murrelet habitat, but it now has a much wider scope and broader public interest. In addition, there is increasing recognition within the scientific community that ecosystem diversity is important. Nearly all of the old growth forest remaining in the North Cascades ecoregion is located in the national forests or national parks.

Lack of baseline data for biodiversity: There is insufficient baseline data on sensitive wildlife species populations and their habitat requirements in the Westside lowlands conifer-hardwood forests of the ecoregion.

Conservation Actions:

- Work with the Forest Service and other public land agencies, as well as willing private landowners, to identify and provide more protection for low elevation conifer-hardwood forest, especially mature forest, which provides critical habitat and connectivity for ecoregional Species of Greatest Conservation Need.
- Work with the Forest Service and other public landowners to protect existing roadless areas and expand the roadless area network where justified for habitat protection and connectivity.
- Work through the Forest Practices Board and directly with forest land management agencies and private landowners to implement forest management prescriptions, including prescribed burns, that will maintain and enhance biodiversity and natural ecosystem function.
- Determine appropriate silvicultural prescriptions for reforesting timber harvest units and promote timber management that maintains a diversity of tree species and structural elements.
- Encourage conservation partnerships with the public. Use citizen science to complete habitat enhancement, inventory and monitoring projects.

Subalpine Parkland

Subalpine parkland in the North Cascades occurs at 5000 to 7000 feet in elevation on the north slopes, above montane conifer forest or lodgepole pine forest habitat. Associated wetlands in subalpine parklands extend a short distance into the alpine zone. Subalpine habitat generally appears as a mosaic of treeless openings and small patches of trees or as woodlands or savanna-like stands of scattered trees. Herb or shrub-dominated wetlands appear within the parkland areas and are considered as part of this habitat. Fragile plants such as heather, partridge foot and Sitka valerian flourish in high elevation meadows. The parklands include slide alder and false azalea. Numerous alpine and subalpine flowers like phlox, Indian paintbrush, elephant head, columbine, Davidson's penstemon and mountain lupine cover the slopes.

**Selected Species Closely Associated
with Subalpine Parkland
in the North Cascades Ecoregion**

Grizzly bear
Wolverine

Mountain goat

Conservation Problems:

Fire suppression in subalpine parklands has contributed to change in habitat structure and functions. Fire suppression can lead to tree islands coalescing and the conversion of parklands into a more closed forest habitat. Forest conditions can displace subalpine parkland conditions through tree invasions.

Conservation Actions:

- Work through the Forest Practices Board and directly with forest land management agencies and private landowners to implement forest management prescriptions that

will maintain and enhance subalpine parkland biodiversity and natural ecosystem function.

Westside Riparian-Wetlands

Riparian habitat covers a relatively small area in the North Cascades ecoregion, yet it supports a higher diversity and abundance of fish and wildlife than any other habitat in the ecoregion; provides important fish and wildlife breeding habitat, seasonal ranges, and movement corridors; is highly vulnerable to alteration; and has important social values, including water purification, flood control, recreation and aesthetics.

Historically, riparian habitat was limited in the North Cascades, except near the mouths of the river tributaries. Riparian-wetland habitat is characterized by a mosaic of plant communities occurring at irregular intervals along streams and dominated by grass-forbs, shrub thickets and mature forests with tall deciduous trees. Beaver activity and natural flooding are two ecological processes that have affected the quality and distribution of riparian-wetlands in the North Cascades.

Selected Species Closely Associated with Westside Riparian-Wetlands and Herbaceous Wetlands in the North Cascades Ecoregion	
Fisher	Great blue heron
Harlequin duck	Western toad
Beller's ground beetle	Oregon spotted frog
Columbia spotted frog	Common loon
Western grebe	Beller's ground beetle
Long-horned leaf beetle	

Conservation Problems: Riverine wetland habitats in the ecoregion have been altered, degraded, fragmented and lost due to numerous factors.

Development and disturbances: Off-road recreational vehicle use and cutting and spraying of riparian vegetation for eased access to water courses, particularly in high-use recreation areas and during nesting season, has destroyed riverine wetland habitat and reduced wildlife productivity.

Livestock overgrazing has widened stream channels, raised water temperatures, and reduced understory cover.

Hydrological diversions and control of natural flooding regimes results in reduced stream flows and reduction of overall area of riparian habitat, loss of vertical stratification in riparian vegetation, and lack of recruitment of young cottonwoods, ash, willows, etc. Hydro projects also destabilize streambanks, narrow stream channels, reduce the flood zone, and reduce the extent of riparian vegetation.

Exotic species: Human activities lead to the conversion of native riparian vegetation to invasive exotics and the introduction of exotic wildlife, such as stocking lakes and streams with non-native fish species, that compete with native species for cover and food. Native

riparian shrub and herbaceous vegetation have been replaced with exotic species such as reed canary grass, purple loosestrife and perennial pepperweed.

Reed canary grass is an aggressive non-native species that invades disturbed areas and is pervasive throughout the western United States. Many infestations of reed canary grass have been identified at Ross Lake, ranging from individual plants to 5-acre patches. Reed canary grass thrives in wetland stream outlets where water levels fluctuate. Native fish and other animals are not well adapted to spawn or reproduce in reed canary grass thickets. Reed canary grass threatens the habitats of plant and wildlife species currently listed on Threatened and Endangered Species lists, such as the Oregon spotted frog. Reed canary grass also directly affects habitats that support 27 Washington state-listed plant species.

Conservation Actions:

- Protect soil and riparian vegetation by designating appropriate buffer zones and/or installing fencing to exclude livestock from sensitive areas.
- Implement modified silvicultural prescriptions that promote local topographic, soil and vegetative conditions.
- Regulate public access to sensitive riparian areas.
- Work with public and private landowners to implement environmentally-sound methods of invasive species control.
- Conserve and protect riparian-wetlands through acquisitions, conservation easements, cooperative agreements, etc.
- Encourage private landowners to participate in habitat stewardship projects.
- Conduct research on sediment levels, overall substrate composition and stream channel morphology including in-channel, large wood, pool frequency and quality, habitat composition, and bank stability.
- Improve understanding of the ecological processes of seeps, bogs, wet meadows, forested wetlands, marshes, springs and other wetlands, and how they are impacted by human development.